

IN THE CLAIMS:

This version of the claims replaces and supercedes all prior versions of the claims.

1. (Previously Presented) A ultrasound puncture system comprising:

a handpiece which accommodates an ultrasound vibrator as ultrasound wave generating means;

a puncturing probe having a pointed distal end portion that punctures a biological wall and penetrates through said biological wall by transmitting ultrasound waves to said biological wall which is to be punctured;

an outer cover tube which covers the probe and is detachably attached to the handpiece, said outer cover tube having a distal end portion that punctures said biological wall as the handpiece punctures said biological wall, and penetrates through said biological wall as the handpiece penetrates through said biological wall;

an ultrasound power source unit for supplying energy for driving the ultrasound vibrator;

termination means installed in the ultrasound power source unit for terminating the energy supply to the ultrasound vibrator;

impedance detection means installed in the ultrasound power source unit for detecting the puncture state when the probe punctures the biological wall;

electric current detection means for detecting the electric current component of the energy supplied to the ultrasound vibrator;

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voltage detection means for detecting the voltage component of the energy;

operation means for deriving the impedance from the detection results of the electric current and voltage detection means; and

decision means for deciding that the probe has penetrated the biological wall based on the results of the operation means.

2. (Original) The ultrasound puncture system according to claim 1, wherein

there is a space open from the base end portion of the probe to the distal end portion of the probe between the outer cover tube and the probe;

the ultrasound power source unit comprises fluid supply means for supplying a fluid to the space; and

the penetration of the probe through the biological wall is detected with the impedance detection means and the supply of energy to the ultrasound vibrator is terminated by the detection output.

3. (Previously Presented) The ultrasound puncture system according to claim 1, wherein the penetration through said biological wall is judged based upon whether the impedance is below a predetermined threshold value.

4. (Original) The ultrasound puncture system according to claim 3, wherein

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each of the electric current detection means and the voltage detection means is provided with an A/D converter for converting the detection results into digital data.

5. (Original) The ultrasound puncture system according to claim 1, wherein
a first electrode and a second electrode are provided in the ultrasound power source unit;
one of the electrodes is connected to so as provide for electric conductivity to the probe; and
the system further comprises discrimination means for converting the impedance between the electrodes and judging the results detected with the impedance detection means.

6. (Previously Presented) A ultrasound puncture system comprising:
a handpiece which accommodates an ultrasound vibrator as ultrasound wave generating means;
a puncturing probe for transmitting ultrasound waves to a biological wall which is to be punctured;
an outer cover tube which covers the probe and is detachably attached to the handpiece;
an ultrasound power source unit for supplying energy for driving the ultrasound vibrator;

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termination means installed in the ultrasound power source unit for terminating the energy supply to the ultrasound vibrator; and

impedance detection means installed in the ultrasound power source unit for detecting the puncture state when the probe punctures the biological wall, wherein

the penetration of the probe through the biological wall is detected with the impedance detection means and the supply of energy to the ultrasound vibrator is terminated by the detection output wherein a first electrode and a second electrode are provided in the ultrasound power source unit;

one of the electrodes is connected to so as provide for electric conductivity to the probe; and

the system further comprises discrimination means for converting the impedance between the electrodes and judging the results detected with the impedance detection means; wherein

the outer cover tube is composed of a non-conductive member and a conductive member;

the non-conductive member is disposed on the inner surface of the outer cover tube, which is in contact with the probe; and

the second electrode is electrically connected to the conductive member of the outer cover tube.

7. (Previously Amended) A ultrasound puncture system comprising:

a handpiece which accommodates an ultrasound vibrator as ultrasound wave generating means;

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a puncturing probe for transmitting ultrasound waves to a biological wall which is to be punctured;

an outer cover tube which covers the probe and is detachably attached to the handpiece;

an ultrasound power source unit for supplying energy for driving the ultrasound vibrator;

termination means installed in the ultrasound power source unit for terminating the energy supply to the ultrasound vibrator; and

impedance detection means installed in the ultrasound power source unit for detecting the puncture state when the probe punctures the biological wall, wherein

the penetration of the probe through the biological wall is detected with the impedance detection means and the supply of energy to the ultrasound vibrator is terminated by the detection output; wherein

means for supplying the energy to the ultrasound vibrator and fluid supply means for supplying a fluid into the space between the outer cover tube and the probe are separate units;

each of those units comprises communication means for causing them to operate in response to each other; and

fluid supply means supplies the fluid to the vibrator via the communication means in response to the energy supply.

8. (Previously Presented) A ultrasound puncture system comprising:

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a handpiece which accommodates an ultrasound vibrator as ultrasound wave generating means;

a puncturing probe for transmitting ultrasound waves to a biological wall which is to be punctured;

an outer cover tube which covers the probe and is detachably attached to the handpiece;

an ultrasound power source unit for supplying energy for driving the ultrasound vibrator;

termination means installed in the ultrasound power source unit for terminating the energy supply to the ultrasound vibrator; and

impedance detection means installed in the ultrasound power source unit for detecting the puncture state when the probe punctures the biological wall, wherein

the penetration of the probe through the biological wall is detected with the impedance detection means and the supply of energy to the ultrasound vibrator is terminated by the detection output; wherein a sheath is further disposed between the probe and the outer cover tube, and means is provided for causing the distal end of the sheath to protrude forward beyond the distal end portion of the probe in response to an output of the impedance detection means that detected that the distal end portion of the probe has penetrated through the biological wall.

9. (Cancelled)

10. (Cancelled)

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